Fixing FPV Video Issues – Noise, VTX Connection, Power Filtering

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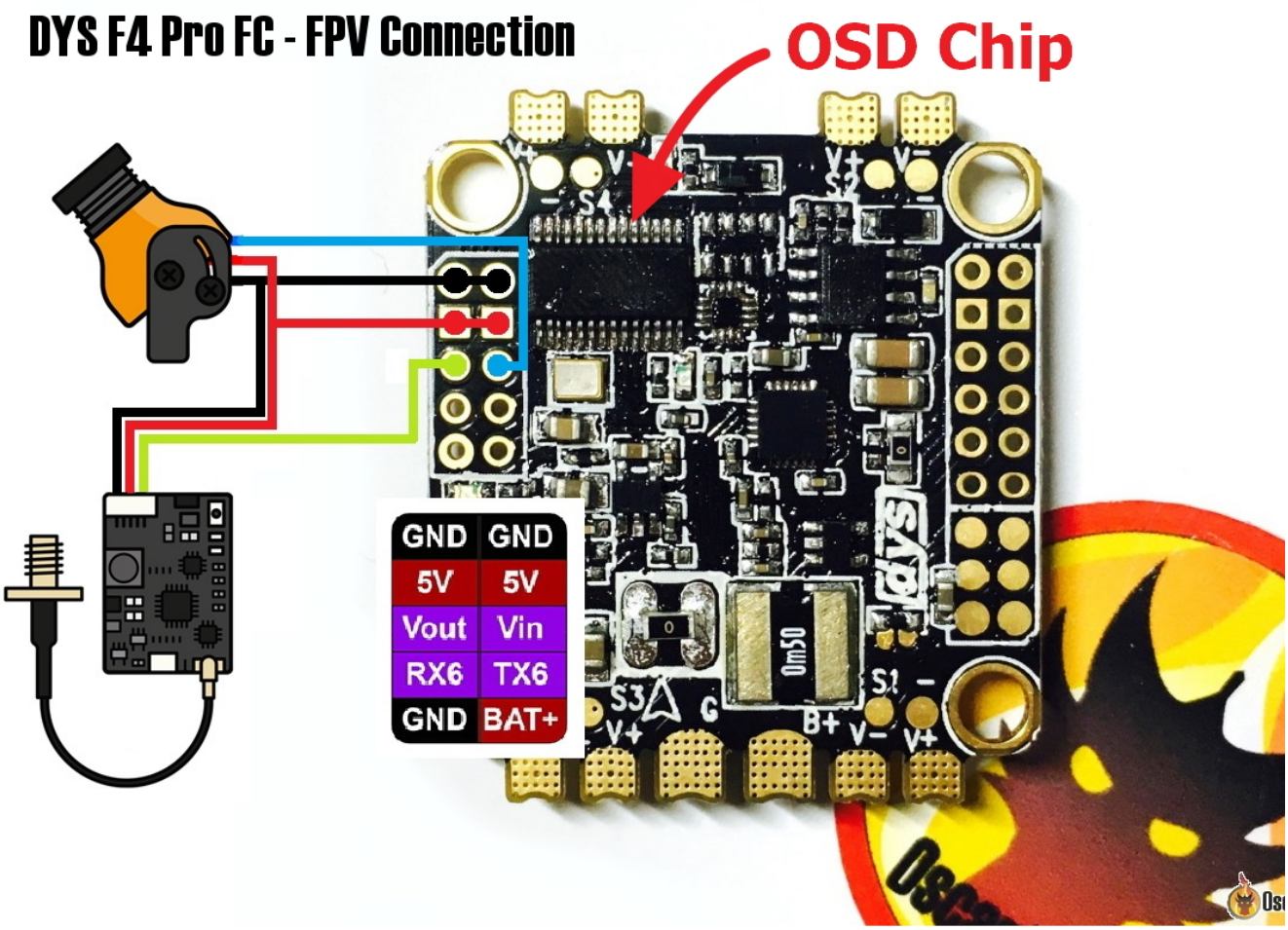
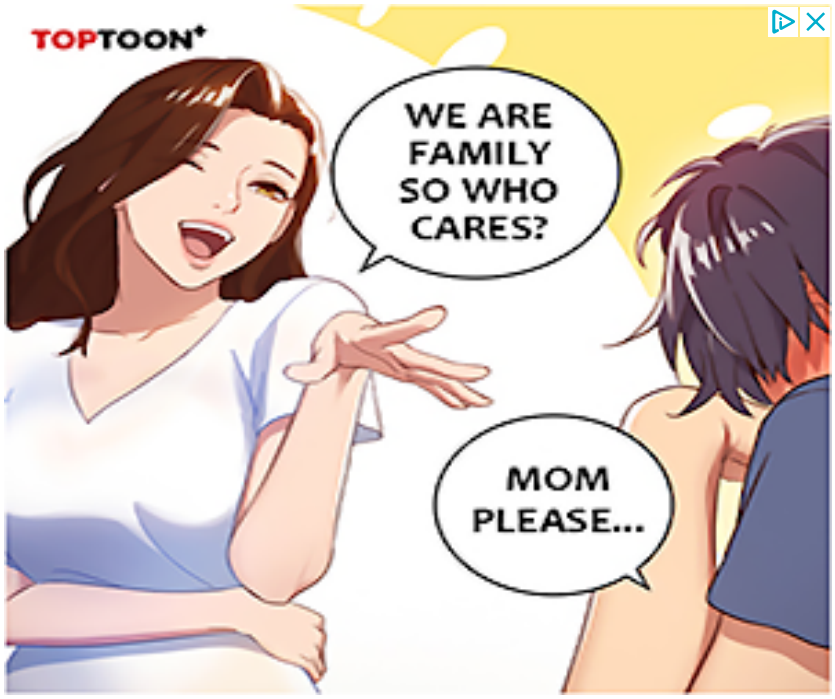


In this article I will share some tips on how to fix issues and best practices to follow to avoid FPV videc problems. Interference and noise in your FPV video feed can be a major headache, and some issues your VTX can even affect other people you are flying with.



Ta2ble of Content

- How to power VTX and Camera
- LiPo is noisy
- Every ground pin is different
- Signal ground
- White lines
- Black lines
- Connect camera to VTX directly
- LC Filter
- Jello

All FPV Cameras Compilation in this spreadsheet.

All 5.8GHz VTX Compilation in this spreadsheet.

Best Way to Power VTX and Camera

First things first, you have to ascertain what voltage your FPV camera is capable of receiving. Most FF cameras these days have a wide operating voltage often from 5V to 30V or even higher.

The safest way to power your FPV camera is from the VTX. Many VTX's these days have a filtered 5V dedicated for powering FPV cameras. Even if you are already using a filtered power source for your V still recommend using the filtered output from the VTX for the camera, any additional filtering is better.

If your can't power the FPV camera directly from the VTX for any reason, the next best thing is to pow VTX and camera from the same filtered and regulated power source.

Most noise related issues are caused by powering either the FPV camera or VTX, or both, directly fror main LiPo battery.

Power Directly from LiPo is Noisy

As mentioned, the majority of FPV cameras and VTX's these days can be powered directly from a 4S 6S LiPo battery. However, just because you can, it doesn't mean you should.

Any video device likes a stable power source so it can transmit a nice clean image. The constant fluctu power conditions that are brought about by the ESC's and motors make the raw voltage from a LiPo b noisy. This noise can pass through the PDB or flight controller to your VTX and FPV camera, subsequ manifesting as interference in your FPV goggles.

feed, you need the cleanest possible power for your camera and VTX, which is where capacitors come play.

Where to Add Capacitors

Additional capacitors (or caps) are often used at the power input of a device to clean up the electrical r Theoretically a cap placed closest to the source of the noise is the most effective, hence pilots adding individual ESC's on the arms of their quads.

How you are supplying power to your VTX will determine the best place to install a cap. If it's getting p from 5V then you should put the cap on the 5V rail, it's it's 12V then put the cap on the 12V rail. If it's p directly from the LiPo, then put the cap on the XT60 pads.

I see a lot of people add capacitors at the XT60 pads regardless of how the VTX is being powered, this help reduce the amount of noise in your power system generally, but may not be the most effective sol your video.

Twisting Signal and Ground Wires

It is good practice to twist the video signal and ground wires together, this acts like a shield against ind external noise from ESC's and BEC inductors. Also keep the VTX signal and power wires away from a inductors.

Keeping ESC aways from FC BEC

The MOSFET on your ESC can create interference that affects your FC, and if your camera and VTX a connected to it, you might get noisy video.

In this post I explained how to minimize noise from the ESC FET's getting to the FC with shielding.

Every Ground Pin Is Different

Ideally, all ground pins are the same, but in reality that's not necessarily true.

Ground pins are connected using a piece of wire or a copper trace on a PCB. Any piece of wir :op

Because of this, there will be a voltage difference between two ground pins on a circuit board if there is current flowing through them. Think of this as an extremely tiny resistor.

This is why it's best practice to connect the grounds of your VTX and FPV camera to the same pin, or ground pins as close to each other as possible.

Signal Ground Is Important

There is current going through the power and signal wires, and eventually it has to return to its source ground wires. It's a complete cycle, that's why it's called a "circuit".

When you don't have signal ground connected, the signal can only return to its source through the pov ground. Therefore the signal will be "more vulnerable" to the noise in the power. By having a signal grc you can better "isolate" the signal from the power.

This is especially important when you are powering your FPV system directly from the main LiPo batte

"White Lines" in Video?

"White lines" are usually a sign of excessive electrical noise in the power to either the FPV camera or V both. Adding a low ESR capacitor to the ESC power, or XT60 pads should usually fix it.

Further Reading: why and where to add low ESR capacitor in a mini quad?

When you are getting lines in your FPV video, try to fix your FPV setup's power first by powering your camera from your VTX. If that doesn't work, try adding a capacitor.

"Black Lines" in Video?

"Black lines" are usually low power related, which are commonly caused by a power hungry VTX. Som don't do well with stepped-down voltage, and they might struggle to deliver the desired output power.

If you are getting black lines in the video feed, you might find the issue to be worse at a higher output p such as 800mW than a lower power such as 25mw. If that's indeed the case then it's definitely related insufficient power or voltage to the VTX.

Connecting FPV Camera to VTX Directly

Don't wire things you aren't using, such as OSD or camera control. Unnecessary wiring might introduc to your FPV system. If you are not using OSD, simply wire your camera's video output straight to your and bypass the video signal pads on the FC.

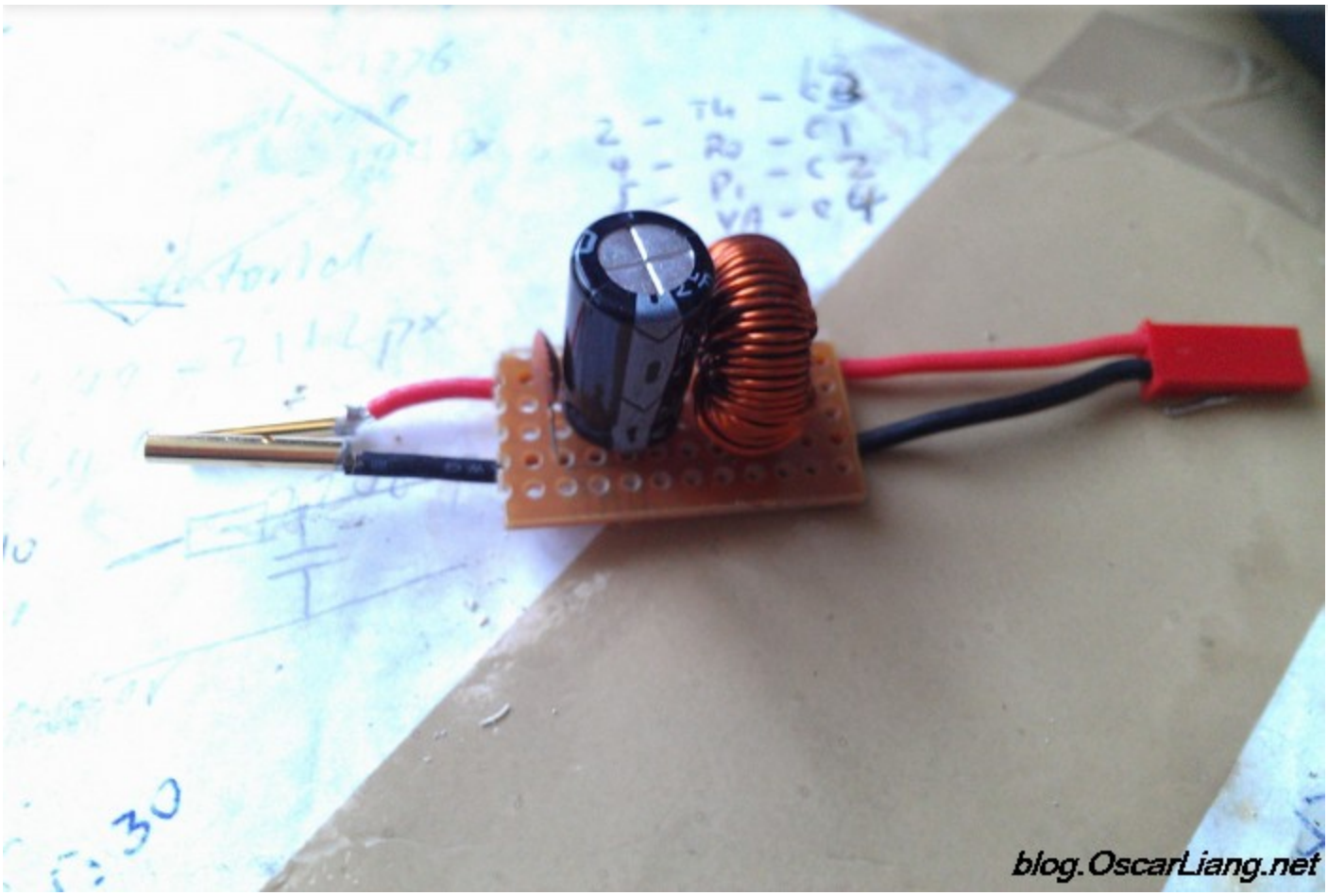
Almost Last Resort

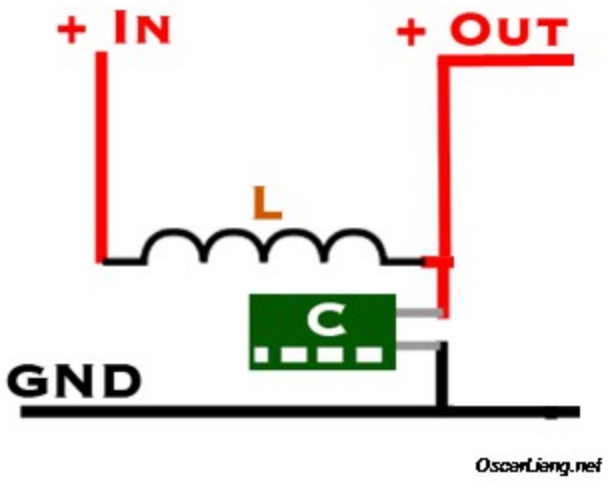
If you are getting some lines in your video, but none of the above helped, it could be the VTX or camer picking up noise from other components. This could be the reason if you run a long signal wires from t camera and VTX.

The solution is to use a "shielded wire" (mini coax wire) instead of normal silicone wire: https://amzn.to /2OjPaFo

LC Filter

Another solution to cleaner video feed is to use an LC filter between the power and your FPV system. can be bought ready made, or you can DIY your own power filter.





It is good at targeting noise in the power getting to your FPV system, but it doesn't reduce the of the power like a low ESR capacitor does.

Maybe your noise issue isn't related to power at all, many video problems can be traced back to antennas. Make sure both VTX and VRX antennas are both properly mounted, and that they are of the connector type, i.e. RP-SMA / SMA, and the correct polarization RHCP / LHCP. Another thing you can changing your channel, you could be picking up interference from an external source.

Flying with Others?

If you fly with others and there is interference, see this guide on how to select the best channels.

Jello on Well-Tuned Quad

Most FPV cameras these days have CMOS sensors, which means they are more prone to "jello" than cameras. You should not have jello in your FPV video if your quad is well tuned and performing proper you do not hear noticeable oscillations from the quad, but there is jello, check the following:

- loose camera mount screws?
- loose camera lens – is the lens lock nut broken?
- loose camera sensor inside the camera?

If none of these is the cause, try using TPU mounts for the FPV camera. The flexible and soft material absorbs some of the vibrations.

Edit History

- Mar 2018 – Article created
- Apr 2019 – Updated
- Jul 2019 – added "where to add cap" and "twisting signal/ground wires"
- Sep 2019 – added info about "ESC shielding" and matching antennas
- Dec 2019 – Revised

FPV FPV CAMERA INTERMEDIATE VTX

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By using this form, you agree witl storage and handling of your data website. Note that all comments are held for moderation before appearing.

SUBMIT

45 COMMENTS

ROMAN

21st February 2022 - 3:43 pm

Hello Oscar,

I have Skyzone SKY04X goggles. When I have VTX + cam on, the image looks fine but I g black strip, about 1 sm in width, going slowly from bottom up on the screen. Once it gets to another strip from the bottom begins to scroll up. This black strip is barely visible and transp and does not interfere with the image. What could be the issue and how to make it disappe seems like it is related to the goggles themselves. I have the latest firmware for all goggles components installed. Any idea?

Thank you

24th March 2021 - 1:11 pm

"Any piece of wire or copper trace has resistance, capacitance and inductance." I believe o systems NOT DC systems have capacitance and inductance … there may be capacitors a inductors in the dc system but I thought only AC systems had it to take into consideration. a whenever i asked my dad (ELECTRICAL ENGINEERING TECHNOLOGIST) he would say is not so easy to calculate you have to watch out fort capacitive coupling and take into consideration , "capacitance, and inductance and reactance." and it gets way more complic then simple DC systems … I believe it was when i asked him about calculating resistance maybe it was about transformers or something and he would say the multimeter isn't neces correct sometimes because it doesn't take that into consideration. like it is with DC.. Do you what I'm talking about?

PETER PICHLER

22nd February 2021 - 7:55 pm

The "VTX for Racing Drones & Mini Quad" spread sheet lists "TBC" as "VTX Control" for th "HGLRC XJB TX20-V2" – what does that mean (neither Smart Audio nor IRC Tramp?)
Maybe "Team Black Sheep Control" -> would it work to connect a Crossfire TX channel to t Rx input?
I tried SA and Tramp but both did not work…

OSCAR

22nd February 2021 - 11:05 pm

TBC – to be confirmed, means I am not sure. By I've used other VTX from HGLRC almost always use Tramp. It's either SA or Tramp these days, so it's one or the oth

TOM

15th October 2020 - 7:53 pm

Howdy, some cams show power source voltage (integrated OSD).

Video (only) into BEC powered vTx (5V) gave me bad black horizontal lines depending on
Neither caps on cam and/or on ESC helped.
I figured out that the cam's ground needs to go to vTx power source, cam's hot wire (only)
lipo.
I did'nt need caps or LC filters at all.
Why? Because vTx compares vid and ground, same applies to cam's vid. So ground must
same. Et voilá – solved

ROGER

20th August 2020 - 12:08 am

Well, just my 2 cents worth. I have had CONSTANT terrible noise in EVERY quad and airpl
since going to FPV. I have DIY'ed builds, added cap's, LC filters, put all the grounds togeth
separating the grounds, added regulators for the vtx and camera…to no avail. Tried about
different brands of FC's, cameras, and Vtx's with the same result…NOISE. So i bought bin
PNP, recommended by people who said the video is great….not for me. This is my fourth y
FPV which i really enjoy but I am about ready to walk away. No matter what I do or buy I ha
terrible noise on my FPV??? If anyone has suggestions that is not listed in this article pleas
me know because I've tried it all and nothing has helped.

LINDY

30th August 2021 - 12:49 am

How terrible is this "noise"? With everything that you have tried there's only two thi
could be one you're flying in the same spot that has Wi-Fi or 4G tower or some kin
interference or you're unlucky enough to go to multiple places that all have interfer
you are just assuming analog video is supposed to not have any noise but analog
always always have some kind of noise basically but I can't picture it being anythir
since you've tried all these different flight controllers VTX's different quads planes
either where you're flying or you just don't understand analog is going to have a litt
noise all the time you can always go digital and then you'll be golden.

25th June 2020 - 6:41 am

Hi,

short Question from someone who was out of the FPV buissenes since 2015:

(and, I know, it migth sound unusual*g*)

What is the maximum temperature for video transmitters before damage occurs?

Does somebody have any experiences with that?

My newst bnf-quad (Eachine Tyro129) does have a VTX thats capabale of up to 600mhW, way hight than the federal laws allow,

but even on low power settings like 25mhW, the heatsink on top of the VTX gets very, very

Until now, there where no problems, but every time, I get my fingers near the hot heatsink, getting doubts that thats right…

Thanks for a quick answer

Imp

SIMPFALLY

4th April 2020 - 2:06 pm

I have waves of “higher” luminosity lines (5-20pixels) that moves across the screen, they ar regular, sometime change speed and width

vtx -> vbat and camera -> 5v from vtx.

They seem to appear AFTER the OSD because they go over the logo. Nothing seem to aff them, distance between rx/tx, channels, the quad is disarmed when doing this and power d seem to affect it at all.

Also, it HAD been working perfectly and on the fourth battery pack, noise started to come..

MR.B

28th March 2020 - 1:58 pm

cheers oscar,

nice work you do. maybe you or some guys here can help me. i own a eachine&diatone er added a tbs nano rx to it to use crsf and noticed a different video signal after. Here got

it seems the dark bars are from pack to pack on a slighty different position. sometimes they more – some times less but there always there. because i suggested the vtx and rx interac each other i tried to move the rx as far away from the vtx as possible but didnt made a diffe maybe you got some hint for me? thx in advance

FOTIS

29th February 2020 - 5:04 pm

i had white lines on my video feed because i had at the back together VTX antenna and RX antenna. When i placed RX antenna away and almost 90 degrees to the VTX antenna prob was solved. No capacitor (4S battery) no other change, VTX was already taking power fron

MUHAMMAD ISNAINI ZUHRI ILYAS

6th February 2020 - 11:51 pm

Hello oscar, very great article.
So im having noise (sometime white line or black line) but when im switching to channel R1 noise gone. Im trying changing back to my channel (R8) noise back again.
Why it is possible ?
Thanks for your help

CONSTANTIN

4th January 2020 - 8:05 am

Hi Oscar,
I have an 6S quad with Matek F722 S2 flight controller and TBS VTS HV V1. When motors spinning the video is perfect clean, once the motor start spinnig I get white vertical line (not continuous).
What do you recommend for cleaning the video?
The VTX is powered not direct from battery but with a Micro BEC 6-30V to 5V/9V-ADJ Step Regulator from Matek. Video camera takes voltage from the VTX.

Constantin

OSCAR

13th January 2020 - 3:40 pm

Have you tried all the suggestions in this article?

BRAD IVIE

11th November 2019 - 8:27 pm

Oscar I simply do NOT understand this…..When connecting camera to vid in of FC and VT to vid out of FC I get nothing but black and OSD does not work neither does smart audio. ALTHOUGH when I connect camera signal directly to vtx signal get picture of course no OS leaving smart audio wire connected. WHAT THE HECK??? Why will it work when connecte together but NOT when trying to use OSD and go through the FC board with vid in and vid simply do not get this?? Brand new FC brand new camera brand new vtx tried two different as well same thing??? What gives here???? AT WITS END!! THX Brad.

OSCAR

18th November 2019 - 6:28 pm

Sounds like your FC might have a dead OSD chip. But you do need to power the F testing this, make sure that.

ETAI

4th November 2019 - 8:06 pm

Thanks Oscar,
I will wire from the camera's video signal wire to the FC's Vin.
Camera's 5V and GND to the VTX's 5V and GND.

2nd October 2019 - 1:40 am

Hello Oscar,

Question for you, if I power the camera from the VTx's 5V out, should I ground the camera VTx to the same ground pad on the FC if using the OSD? so that the video (signal) can sha same ground point?

OSCAR

15th October 2019 - 4:40 pm

ground the camera to the ground pin on the VTx next to the 5V pin.

MAKO

4th September 2019 - 8:35 am

I also posted in the forum now:
https://intofpv.com/t-runcam-phoenix-oscar-edition-issues

MAKO

3rd September 2019 - 9:31 pm

Hey Oscar,

i just can upload a picture here sorry:

bilder-upload.eu/bild-1a93fa-1567542515.jpg.html

like i said, lines dont move and we both use the RunCam Phoenix Oscar Edition with differ wiring.

Hey Oscar,

hope you can help me.

Have an unknown problem.

running an mamba f722 stack

TBS Unify Pro Race 5G8 HV Race V2

and the RunCam Phoenix Oscar Edition.

I have like six bars on the screen. they dont move. 3 bars are bright (normal), and 3 bars a
A normal good video, but bright and dark bars.
Do you have any idea how i can fix that?
Use this kind of wiring everywhere, and never had problems. always a perfect clear video.
A friend of mine have the same problem with the same cam, but only 4 bars.

OSCAR

10th September 2019 - 6:27 pm

I think you posted on IntoFPV.com too, I will help you there.

MAKO

29th August 2019 - 11:57 pm

Hey Oscar,
hope you can help me.
Have an unknown problem.
running an mamba f722 stack
TBS Unify Pro Race 5G8 HV Race V2
and the RunCam Phoenix Oscar Edition.
VTX is on 9v on the fc and the Camera is wired on 5v from vtx.
I have like six bars on the screen. they dont move. 3 bars are bright (normal), and 3 bars a
A normal good video, but bright and dark bars.
Do you have any idea how i can fix that?
Use this kind of wiring everywhere, and never had problems. always a perfect clear video.
A friend of mine have the same problem with the same cam, but only 4 bars.

OSCAR

30th August 2019 - 12:11 am

Would you mind posting screenshots, or preferably video at our forum?

CAPNBRY

24th August 2019 - 5:20 pm

What a great list of the different noise sources, sometimes ya just need a list of things to try you're scratching your head. I also had a ton of problems with the R-XSR with telemetry. O small fixed wing builds, the R-XSR would cause the cheap 9g servos to jitter like mad unles wires were kept a long distance away (5cm+?). I spent hours checking the servo signals wi oscilloscope and trying to smooth the 5V line without any success when I realized it stoppe I turned off the transmitter.
Moved the R-XSR to my first quad build, since it has no servos, and the video feed was jus terrible. Swapped it for a Flit10 receiver and boom perfect video (and telemetry receiving is now, where it was hit or miss before). Definitely consider the receiver's EMF when it comes video as well.

RUBEN JOHN

12th August 2019 - 6:41 pm

count me in towards another person that has video noise with the r-xsr. In my case as in th the minute my radio starts receiving telemetry the video goes to crap. I could actually block interference with a piece of that ESD clear grey envelope by putting it over the rx antenna a video would come back ! I have video if you are interested…

REINHARD PLIETSCH

28th July 2019 - 7:17 am

On many of my Builds, I noticed FrSky telemetry over Smartport injecting lots of noise into video signal if the RX antennae (R-XSR) are routed close to any video signal wire to/from C Noise disappears when switching off telemetry. This refers to SHIELDED parts of the RX antennae, the active ends were far out on the arms. Never thought this could matter.
@Oscar, with builds getting tighter and tighter (Medical was my 1st 'cramped' build or

noise. Wouldn't this justify a new article on the 'ideal low-nojse wire and antennae routing c quads'? 🙂

Keep your good work going!

ORI

15th June 2019 - 2:16 pm

Hi!

I have a Tero q215mm quad (rcharlance f4 pro+ v2 FC, 2600kv motors, 30A 2-6S BLHeli – ESC, 1/3 inch super HAD II CMOS camera and a FrSky r xsr receiver) that I bought aroun weeks ago… It was flown before I bought it and I saw it had a normal FPV feed. After Beta setup and checking that the drone and the goggles are on the same frequency, I tried yesterday(14/6/19) a flight test… I got no FPV feed when I started to go barely 3 meters aw also got a lot of weird vertical white lines and blackouts even when I'm near the quad (and disarmed) although I have a capacitor soldered to the xt60 (I have an Eachine vr d2 goggle Can someone tell me what should I do or check?

MADMOSSY

30th April 2019 - 5:42 pm

Any idea what could be causing this issue Oscar, my runcam split mini 2 just refuses to wo matter what combination of connection I use. I have tried from the flight controller (clracing and from vbat, VTX doesn't provide enough power to power the camera directly (TBS Unify HV)

youtu.be/ucMr8muqlUk

OSCAR

30th April 2019 - 6:06 pm

In that case you might need a dedicated 5V regulator for the Split, looks like it's no enough power from the FC. VTX is not going to cut it either.

26th April 2019 - 7:53 pm

I've had bad luck running VTX and camera's off the Flight controller (even with caps installe such as 5V TBS unify. I've been replacing all my 5V vtx's with HV VTX's. I find it easier to c the video feed with capacitors on the battery lead that's powering my VTX. I"m flying 4S an works for me however if your flying 6S that may be a different story, IDK.

OSCAR

30th April 2019 - 5:45 pm

Depends on the FC, some FC have very weak 5V regulators.

MARK PFEIFER

26th April 2019 - 5:06 pm

I was resistant to powering my camera off the 5V on the VTX at first. I mean, there's 5V on board, and that's a cleaner build, right? Eventually I realized that the double filtering provec VTX power output is the way to go, so now I always power my cam that way.

OSCAR

30th April 2019 - 5:43 pm

Yea it's the safest way to do it :)

KEVIN

6th September 2018 - 9:00 pm

So how do we corrct for an FPV feed that gets washed out?
My system runs awesome till I'm airborn and the Video starts losing its color.
Theres a point which the feed becomes a Black & White and only transitions back to color landing.
Other than the color loss the video is crisp and clean, which makes no sence.

Yet the result is the same regardless of channel or receiver used.

OSCAR

9th September 2018 - 8:13 pm

sounds more like a camera issue?

KEVIN

20th September 2018 - 8:11 am

I have three copters with the exact same issue. Swapping out the camera
antenna, power or using another set of goggles / monitor makes no differe
All three use the following common hardware without OSD.
Matek F405
Matek VTX
Frsky R-XSR with telemetry
I have even tried swapping in a micro camera-vtx combo with the same re
IMO this leaves the following posibilities.
-Telemetry is causing interferance.
-Local RF conditions are bad. (Its a farm)
-Hardware in general is crap and thus can't maintain a clean singal, regar
range.

STEVE

12th January 2019 - 12:03 am

I have the same problem. Same flight controller aswell. Did you ever find a solutio

MANOLITO

26th August 2018 - 9:25 pm

text osd dont stop flickering, I joined all the ground cables and now is all perfect, text osd a
Thanks

ILYA

23rd May 2018 - 10:48 am

there's an error in camera spreadsheet
Eachine c800t is 16:9 frame ratio and really it's CMOS not CCD (even if manufacturer says
CCD)
revues.ru/wp-content/uploads/2017/09/Eachine-C800T-25.jpg
and here we can see FH8536E chip
revues.ru/wp-content/uploads/2017/09/Eachine-C800T-26.jpg
which designed for cmos sensors.

OUGOUREH

13th March 2018 - 8:51 am

Hi oscar
thank so much for your helping, I'm very appreciate , I'm beginner in this project so can you
me the link about quadcopter a based Arduino with FPV camera

PAUL

9th March 2018 - 9:14 am

I soldered an ESR 1000uF 35V direct behind 4S-Lipo and in addition a stepdown to approx
12V, Result: absolut clear cam-video, no horizontal lines and no more interrupts. (FPV-equi
Unify, Swift, Immersion-Duo)

YVES

8th March 2018 - 9:00 pm

cam?

like the picture of your thread?

NEFF RAMOS

8th March 2018 - 1:44 am

What type of filtering would you recommend for vtx system that are powered from LiPo. Bo setups have the vtx powered from LiPo and I struggle woth Clean video. Is there some sort filter/regulator you would recommend? Thanks

OSCAR

22nd March 2018 - 6:38 pm

Try LC Filter

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